

Thursday, August 20

Plenary Session

8:00 AM	Registration/Breakfast	Tent
9:00 AM	Welcome — Users' Executive Committee	Building 66 Auditorium
9:05 AM	Molecular Foundry Update Jeff Neaton , <i>Director of the Molecular Foundry, Berkeley Lab; Professor of Physics, University of California, Berkeley</i>	
9:30 AM	Keynote Address: The BRAIN Initiative and Nanoscience Ralph Greenspan , <i>Director of the Center for Brain Activity Mapping; Professor of Biology/Neurobiology Section, and of Cognitive Science, University of California, San Diego; Co-Director, Cal-BRAIN</i>	
10:10 AM	Multiscale Form and Function Using Correlative Microscopy Reveals Insights Into Human Renal Biomineralization Sunita Ho , <i>University of California, San Francisco</i>	Building 66 Auditorium
10:30 AM	Refreshment Break	
11:00 AM	Keynote Address: Science at the Advanced Light Source and Partnering with the Molecular Foundry Roger Falcone , <i>Director of the Advanced Light Source, Berkeley Lab; Professor of Physics, University of California, Berkeley</i>	
11:40 AM	Direct Observation of the Oxyl Radical of Photo-catalytic Water Oxidation Tanja Cuk , <i>University of California, Berkeley</i>	Building 66 Auditorium
12:00 PM	X-ray Spectroscopy and Theoretical Studies of Catalysts and Light Absorbers for Solar Fuel Generation Walter Drisdell , <i>Berkeley Lab</i>	
12:20 PM	Staff Awards — Users' Executive Committee	
12:30 PM	Lunch	Tent
1:30 PM	Town Hall Meeting (users only)	Building 62
2:00 PM	Keynote Address: Precise Chemical, Physical, and Electronic Nanoscale Contacts Paul Weiss , <i>Distinguished Professor of Chemistry & Biochemistry and of Materials Science & Engineering, California NanoSystems Institute, University of California, Los Angeles</i>	Building 66 Auditorium
2:40 PM	Enhanced and Switchable Nanoscale Thermal Conduction Due to van der Waals Interfaces Ravi Prasher , <i>Berkeley Lab</i>	
3:00 PM	Uniform Perovskite Layers For Low Hysteresis Planar Heterojunction Solar Cells Francesca Toma , <i>Joint Center for Artificial Photosynthesis, Berkeley Lab</i>	
3:20 PM	Nanoscale Chemical and Topology Imaging of Block Copolymers with Photo-induced Force Microscopy Derek Nowak , <i>Molecular Vista, Inc.</i>	
3:40 PM	Announcements	
3:45 PM	Poster Session Refreshments & Vendor Visits	Tent
5:45 PM	End of Poster Session	

Friday, August 21 Symposia

Please note that start and end times vary for the individual symposia. See separate sheets for a detailed agenda of each symposium.

7:30 AM	Late Registration/Breakfast	Tent
8:00 AM	Morning Symposia Commence: 8:15 AM – 12:15 PM: Flatter and Faster: Transition Metal Dichalcogenides at the Molecular Foundry, Part I 8:00 AM – 11:30 PM: Soft Materials Assembly and Dynamics 8:00 AM – 12:00 PM: Materials Discovery: Lab-Based and Combinatorial Approaches 8:30 AM – 12:00 PM: Diffraction Mapping of Structure and Properties: Getting Real about Reciprocal Space	Various (See Symposia detail sheet)
10:00 AM	Refreshment Break	Tent
10:30 AM	Morning Symposia Continue	Various
12:00 PM	Lunch	Tent
1:30 PM	Afternoon Symposia Commence: 1:30 PM – 5:00 PM: Flatter and Faster: Transition Metal Dichalcogenides at the Molecular Foundry, Part II 2:00 PM – 5:30 PM: Brain Imaging and Optical Manipulation 1:15 PM – 5:45 PM: Active Nanointerfaces for Electrochemistry 1:30 PM – 5:30 PM: SAXS-WAXS for Nanomaterials	Various (See Symposia detail sheet)
3:30 PM	Refreshment Break	Tent
4:00 PM	Afternoon Symposia Continue	Various
5:30 PM	Meeting Adjourned	

Our participating sponsors:

Andor (Oxford Instruments)
Barnett Technical Services
Bruker Nano Analysis
Edwards Vacuum
Gatan, Inc.
Horiba Scientific

Molecular Vista
NanoMEGAS USA
Oerlikon Leybold Vacuum
Oxford Instruments
PI-Physik Instrumente
Protochips

Renishaw Inc.
SAES Getters
SemiTorr Inc.
Ted Pella
UC Components Inc.

Friday, August 21

Morning Symposia

Flatter and Faster: Transition Metal Dichalcogenides at the Molecular Foundry Part I: Flatter — Controlling Composition, Structure and Defects

Location: **Building 66, Auditorium**

Organizers: Shaul Aloni, Nate Hohman, Jim Schuck, Adam Schwartzberg, Alex Weber-Bargioni

The prevailing winds of advanced electronics have been directed towards 2D materials since the first experimental reports of graphene thirteen years ago. As of late a great focus of these works has shifted from the proto-material to a new class of 2D materials, transition metal dichalcogenides (TMDs), as a result of fascinating properties that appear when TMDs are reduced to a single layer: a direct band-gap in the visible and unusually high optical cross section (5-10% absorption for a single layer), which are ideal for 2D optoelectronic applications; unique spin-valley coupling, opening the new field of valleytronics; and high mobilities relative to their operational thicknesses. In this two-part symposium we will introduce the general topic of TMDs and explore the broad range of ongoing research interests at the Molecular Foundry and the wider TMD community in topics ranging from synthesis, to spectrally resolved imaging, to ultra-high resolution microscopy.

8:15 AM	Opening Remarks
8:30 AM	Post Transition Metal Chalcogenides (PTMCs): Synthesis, Characterization, and Applications <i>Sefaattin Tongay, Arizona State University</i>
9:15 AM	Atomically Precise Imaging of 1-Dimensional Metallic Domain Boundaries in MoSe ₂ <i>Sebastian Wickenburg, Molecular Foundry</i>
9:45 AM	Refreshment Break
10:15 AM	Title TBD <i>Yi Cui, Stanford University</i>
11:00 AM	Atomic Imperfections and Interface in 2D Semiconduc- tors: Manipulation and its Applications <i>Joonkie Suh, University of California, Berkeley</i>
11:30 AM	Panel Discussion and Conclusions
12:00 PM	Lunch

Soft Materials Assembly and Dynamics

Location: **Building 62, Room 203**

Organizers: Caroline Ajo-Franklin, Ranjan Mannige, Alex Noy, Steve Whitelam

Soft materials are characterized by their multiple weak interactions, which can allow self-assembly, permit structural reorganization, and confer selectivity for other materials. In this symposium we will present an overview of soft and bioinspired materials of current interest to the Foundry and its user community. Such materials include bioinspired nanostructures and hybrid biomaterials; their applications range from the sensing of small molecules to drug delivery. Come along to see the latest in soft materials research, and to put forward your view on the future of "soft" and "bioinspired" at the Foundry.

8:00 AM	Self-Assembly of Peptoid Block Copolymers <i>Ken Downing, Berkeley Lab</i>
8:30 AM	Dissipation of Osmotic Gradients in Topologically Closed Giant Vesicles <i>Atul Parikh, University of California, Davis</i>
9:00 AM	Engineering the Size and Permeability of Capsid-Like Protein Shells <i>Danielle Tullman-Ercek, University of California, Berkeley</i>
9:30 AM	Design of Stimuli Responsive Peptide-Based Delivery Vehicles via Multiscale Modeling <i>Hung D. Nguyen, University of California, Irvine</i>
10:00 AM	Refreshment Break
10:30 AM	Ultra-Fast Proton Transport in Sub-1-nm Diameter Carbon Nanotube Porins <i>Ramya Tunuguntla, Lawrence Livermore National Lab</i>
11:00 AM	Round Table Discussion
11:30 AM	Session Adjourned

Materials Discovery: Lab-Based and Combinatorial Approaches

Location: **Molecular Foundry (Building 67), Chemla Room (3111)**

Organizers: Raffaella Buonsanti, Emory Chan

To confront the material challenges shared by many research fields — including batteries, fuel cells, and solar fuels — a close coupling of theoretical understanding and advanced synthesis approaches is crucial. This symposium will bring together theorists and experimentalists to discuss high-throughput combinatorial approaches, to explore broad compositional ranges, as well as lab-based synthetic routes, to achieve a precise tuning of materials structure and composition.

8:00 AM	Workshop Intro from Organizers
8:15 AM	Precursor Conversion Kinetics and the Nucleation and Growth of Metal Chalcogenide Quantum Dots <i>Jon Owen, Columbia University</i>
8:45 AM	Synthesis of Quaternary Semiconductor NCs <i>Ajay Singh, University of Texas, Austin</i>
9:10 AM	Synthesis of Quaternary Oxide NCs <i>Anna Loiudice, Berkeley Lab</i>
9:35 AM	Silver Nanoparticle Solubility Enhancement via Heuristic Optimization <i>Jake Sadie, University of California, Berkeley</i>
10:00 AM	Refreshment Break
10:30 AM	Discovering Electrocatalysts and Solar Light Absorbers Using High Throughput Experimentation <i>John Gregoire, California Institute of Technology, Joint Center for Artificial Photosynthesis</i>
11:00 AM	Combinatorial Approach to Accelerate Material Discovery for Energy Storage <i>Wei Tong, Berkeley Lab</i>
11:30 AM	Materials Data in the 21st Century <i>Kyle Michel, Citrine Informatics</i>
12:00 PM	Lunch

Diffraction Mapping of Structure and Properties: Getting Real about Reciprocal Space

Location: **Building 66, Room 316**

Organizers: Jim Ciston, Peter Ercius, Colin Ophus, Mary Scott

Fast detectors have enabled new modes of operation for both electron microscopes and synchrotron sources. There is a common theme emerging in the use of these detectors for techniques centered on the collection of data from the full field of reciprocal space: ptychography, coherent diffractive imaging, scanning PACBED, orientation imaging, and nanobeam diffraction strain mapping are just a few examples. This symposium will focus on the applications of these techniques to nanoscale materials science as well as successes, challenges, and needs for the management and processing of these large data streams.

8:30 AM	Imaging Chemistry in 3D with Nanometer Resolution Using Soft X-Rays <i>David Shapiro, Advanced Light Source, Berkeley Lab</i>
9:00 AM	Detecting Medium Range Order in Diffraction Amorphous Materials by Fluctuation Electron Microscopy <i>Tony Li, Lawrence Livermore National Lab</i>
9:30 AM	Nano-scale Characterization of Ordering and Texture of FePt Granular Layer for Heat-Assisted Magnetic Recording Application <i>Burak Ozdol, Western Digital Technologies, Inc.</i>
10:00 AM	Refreshment Break
10:30 AM	Accelerating Discovery from Image-Based Experiments <i>Dani Ushizima, Berkeley Lab</i>
11:00 AM	Combinatoric Materials Characterization at the Advanced Light Source <i>Alpha N'Diaye, Advanced Light Source, Berkeley Lab</i>
11:30 AM	Looking Below the Surface: Multimodal 3D Mapping in Photovoltaics Using Two-Photon Microscopy <i>Ed Barnard, Berkeley Lab</i>
12:00 PM	Lunch

Friday, August 21

Afternoon Symposia

Flatter and Faster: Transition Metal Dichalcogenides at the Molecular Foundry Part II: Photonics, Valleytronics, and New Tools

Location: **Building 66, Auditorium**

Organizers: Shaul Aloni, Nate Hohman, Jim Schuck, Adam Schwartzberg, Alex Weber-Bargioni

The prevailing winds of advanced electronics have been directed towards 2D materials since the first experimental reports of graphene thirteen years ago. As of late a great focus of these works has shifted from the proto-material to a new class of 2D materials, transition metal dichalcogenides (TMDs), as a result of fascinating properties that appear when TMDs are reduced to a single layer: a direct band-gap in the visible and unusually high optical cross section (5-10% absorption for a single layer), which are ideal for 2D optoelectronic applications; unique spin-valley coupling, opening the new field of valleytronics; and high mobilities relative to their operational thicknesses. In this two-part symposium we will introduce the general topic of TMDs and explore the broad range of ongoing research interests at the Molecular Foundry and the wider TMD community in topics ranging from synthesis, to spectrally resolved imaging, to ultra-high resolution microscopy.

1:30 PM	Opening Remarks
1:45 PM	Ultrafast Dynamics in MX ₂ Feng Wang, University of California, Berkeley
2:30 PM	Broken Inversion Symmetry and Excitonic Dark States in Transition Metal Dichalcogenide Ziliang Ye, Stanford University
3:00 PM	Refreshment Break
3:30 PM	MAESTRO: A New Facility for Characterization of In-situ Fabricated Heterostructures at the Advanced Light Source Eli Rotenberg, Advanced Light Source, Berkeley Lab
4:15 PM	The Nanoscale Excitonic Anatomy of Monolayer MoS ₂ Nicholas Borys, Molecular Foundry, Berkeley Lab
4:45 PM	Panel Discussion and Conclusions
5:00 PM	Session Adjourned

Brain Imaging and Optical Manipulation

Location: **Building 62, Room 203**

Organizers: Bruce Cohen, Jon Sack, Jim Schuck

The Presidential BRAIN Initiative, aimed at establishing a full understanding of the global network activity of the brain, faces a major technological barrier in high resolution, real-time monitoring and manipulation of neural activity over large areas of the brain. By integrating neuroscience with (nano) engineering, researchers are now exploring a number of promising approaches to surmount that barrier. This symposium will highlight current work in this direction, discussing future possibilities for using light to detect and control a range of relevant electrical and chemical signals in the nervous system.

2:00 PM	Chemistry and Engineering of Voltage-Sensitive Fluorescent Proteins for Imaging Neuronal Activity Michael Lin, Stanford University
2:45 PM	Monitoring The Dynamics of Neural Circuitry in Health And Disease Lin Tian, University of California, Davis
3:30 PM	Refreshment Break
4:00 PM	Near Infrared Optogenetics with Photoswitchable Neurotransmitters Elizabeth Carroll, University of California, Berkeley
4:45 PM	Nanoscale Optogenetic Manipulation of Neuronal Circuit Dr. Jillian Iafrati, University of California, San Francisco
5:30 PM	Session Adjourned

Active Nanointerfaces for Electrochemistry

Location: **Molecular Foundry (Building 67), Chemla Room (3111)**

Organizers: David Prendergast, Brett Helms, Bryan McCloskey

This symposium explores recent developments in the synthesis/fabrication, characterization or understanding of nanoscale details in interfaces of relevance to active processes in electrochemistry. These interfaces may include, but are not limited to, electrode-electrolyte interfaces, separators and membranes. Particular emphasis will be placed on understanding and control of electrochemical processes.

Symposium Goal: to inspire discussion on what can be done to better understand/explore nanoscale aspects of electrochemistry in action at interfaces.

1:15 PM	Introduction and Welcome
1:30 PM	A Computational Approach to Understanding, Predicting and Designing Transition-Metal Oxide Electrocatalysts <i>Aleksandra Vojvodic, SLAC National Accelerator Laboratory</i>
2:00 PM	Interfacial Charge Induced Phenomena in Graphene Based Supercapacitors from Theory and in Operando Characterization <i>Brandon Wood, Lawrence Livermore National Lab</i>
2:30 PM	Insights of Electrochemical Reactions from the In-Situ/ Operando Soft X-Ray Spectroscopy <i>Jinghua Guo, Berkeley Lab</i>
3:00 PM	Title TBD <i>Adam Weber, Berkeley Lab</i>
3:30 PM	Refreshment Break
4:00 PM	Near Field IR Nanoscale Imaging of the Solid Electrolyte Interphase on Li-ion Negative Electrodes <i>Robert Kostecki, Berkeley Lab</i>
4:30 PM	Electrochemical Redox of Late Transition Metal Perovskite Oxides <i>William Chueh, Stanford University</i>
5:00 PM	Plasma Enhanced Atomic Layer Deposition of Highly Active Cobalt Oxide Water Oxidation Catalysts <i>Ian Sharp, Joint Center for Artificial Photosynthesis, Berkeley Lab</i>
5:30 PM	Summary and Closing Remarks
5:45 PM	Session Adjourned

SAXS-WAXS for Nanomaterials

Location: **Building 66, Room 316**

Organizers: Elaine Chan, Alex Hexemer, Ron Zuckermann

X-ray scattering is a valuable technique in the material scientist's toolbox for examining the structure of materials at nano- and mesoscopic length scales. The small/wide angle X-ray scattering (SAXS/WAXS) beamlines at the Advanced Light Source (ALS), a DOE X-ray science facility at LBNL, provide the capabilities for measurements of static structure, as well as of dynamic structural changes, such as self-assembly, that occur under a variety of in-situ conditions. This symposium provides an overview of the high-throughput measurement and data analysis capabilities that are available to the Foundry community at the ALS. It will also highlight recent work by joint facility users which demonstrate the benefits of bringing together the synthesis and characterization expertise at both facilities in order to improve understanding of materials structure and function. Examples include polymer blends, assemblies, and nanocomposites for applications in the areas of semiconductors, fuel cells, batteries, solar energy, separations, and bio-inspired systems. Lastly, this symposium will provide a forum for discussion of potential experiments and additional Foundry-ALS collaborations in the future.

1:30 PM	SAXS/WAXS and Data Science at the ALS <i>Alex Hexemer, Advanced Light Source, Berkeley Lab</i>
2:00 PM	RSOXS: A New Nano- and Mesoscale Materials Characterization Technique <i>Cheng Wang, Advanced Light Source, Berkeley Lab</i>
2:30 PM	Exploring the Structure of Semiconducting Polymers Using X-Rays <i>Gregory Su, University of California, Santa Barbara</i>
3:00 PM	Quantifying the Hierarchical Structure of Carbon Nanomaterials Across Four Orders of Magnitude in Length Scale <i>Eric Meshot, Lawrence Livermore National Lab</i>
3:30 PM	Refreshment Break
4:00 PM	Role of X-Ray Characterization in Ion-Conducting Soft Matter <i>Ahmet Kusoglu, Berkeley Lab</i>
4:30 PM	Dynamic Morphology of Characterization of Organic Bulk Heterojunction Blends <i>Feng Liu, Berkeley Lab</i>
5:00 PM	Folding & Assembly of Sequence Defined Peptoid Polymers <i>Ron Zuckermann, Molecular Foundry, Berkeley Lab</i>
5:30 PM	Session Adjourned